NALLA NARASIMHA REDDY EDUCATION SOCIETY'S
GROUP OF INSTITUIONS

(UGC AUTONOMOUS INSTITUTION)

B.Tech. in ELECTRONICS AND COMMUNICATION ENGINEERING

List of Open Electives (R22 Regulations)

Applicable from 2022-23 Admitted Batch

Open Elective (OE – I)	Open Elective (OE – II)	Open Elective (OE – III)
1. Fundamentals of Internet of Things 2. Principles of Signal Processing 3. Digital Electronics for Engineering	1. Electronic Sensors 2. Electronics for Health Care 3. Telecommunications for Society	1. Measuring Instruments 2. Communication Technologies 3. Fundamentals of Social Networks

22EC611OE: FUNDAMENTALS OF INTERNET OF THINGS (OE – I)

B.Tech. III Year II Semester **L T P C**

3 0 0 3

Course Objectives: The objectives of the course are to:

- Make concepts of Internet of Things understandable to build IoT applications.
- Teach the programming and use of Arduino and Raspberry Pi boards.
- provide Knowledge about data handling and analytics in SDN.

Course Outcomes: Upon completing this course, the students will be able to

- Know basic protocols in sensor networks.
- Program and configure Arduino boards for various designs.
- Python programming and interfacing for Raspberry Pi.
- Design IoT applications in different domains.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	-	-	-	-	-	2	1	1
CO2	1	1	1	-	3	-	-	-	-	1	1	2
CO3	1	1	1	-	3	-	-	-	-	1	1	2
CO4	1	1	3	-	3	-	-	-	-	1	1	2

UNIT – I Introduction to Internet of Things: Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT - II Machine-to-Machine Communications: Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.

UNIT – III Implementation of IoT with Raspberry Pi: Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi.

UNIT - IV Software defined Network and Data Analytics: Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics.

UNIT - V Cloud Computing: Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT.
Case Study: Agriculture, Healthcare, Activity Monitoring

TEXT BOOKS:

1. "The Internet 'of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. “Make sensors”: Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media, 2014.
3. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti

REFERENCE BOOKS:

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”
2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".
3. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013

22EC612OE: PRINCIPLES OF SIGNAL PROCESSING (OE- I)

B.Tech. III Year II Semester **L T P C**
3 0 0 3

Course Objectives:

1. To give the basics of Signals and Systems required for all Engineering related courses.
2. To provide the basic characteristics of LTI systems.
3. To provide knowledge on signal transmission requirements.
4. To give basic understanding of signal statistical properties and noise source concepts.

Course Outcomes: Upon completing this course, the student will be able to:

1. Differentiate various signal functions.
2. Understand the characteristics of linear time invariant systems.
3. Understand the concepts of sampling theorem and signal to noise ratios.
4. Determine the Spectral and temporal characteristics of Signals.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	1	-	1	-	-	-	1	1	1
CO2	3	1	-	2	-	1	-	-	-	1	1	1
CO3	2	2	-	3	-	1	-	-	-	1	1	1
CO4	3	1	-	2	-	1	-	-	-	1	1	1

UNIT I: Signal Analysis: Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT II: Signal Transmission through Linear Systems: Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT III: Sampling theorem: Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

UNIT IV: Temporal characteristics of signals: Concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Time Averages and Ergodicity, Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Cross-Correlation Function and Its Properties, Power Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function.

UNIT V: Noise sources: Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, B.S. Publications, 2013.
2. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4 th Ed., 2001.

REFERENCE BOOKS:

1. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed.
2. Fundamentals of Signals and Systems - Michel J. Robert, MGH, 2008.
3. Random Processes for Engineers-Bruce Hajck, Cambridge unipress, 2015
4. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003

22EC613OE: DIGITAL ELECTRONICS FOR ENGINEERING (OE-I)

B.Tech. III Year II Semester **L T P C**

3 0 0 3

Course Objectives:

1. To provide basic understanding of properties and theorems of Boolean Algebra.
2. To provide knowledge on logic gates and universal gates.
3. To teach techniques to reduce the Boolean expressions using K map.
4. To give introduction to Logic families and different types Integrated circuits.

Course Outcomes: Upon completion of this course, the students will be able to

1. Get basic knowledge on logic gates, Universal gates and their switching logics.
2. Realize Boolean expressions using NAND/NOR gates and reduce them using K map.
3. Know all types of combinational and sequential circuits.
4. Acquire knowledge on realization of logic families using diodes and transistor, and also on different types of integrated circuits.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	-	-	-	-	-	1	-	-	1
CO2	2	2	3	2	-	-	-	-	1	-	-	1
CO3	1	1	2	1	-	-	-	-	1	-	-	1
CO4	1	1	1	-	-	-	-	-	1	-	-	1

UNIT - I: Number Systems: Number systems, Complements of Numbers, Codes- Weighted and Nonweighted codes and its Properties. Boolean Algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT - II: Minimization of Boolean functions: Karnaugh Map Method - Up to four Variables, Don't Care Map Entries, Tabular Method, Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

UNIT - III: Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Fundamentals of shift registers, ripple and decade counters.

UNIT - IV: Realization of Logic Gates Using Diodes & Transistors: AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL, CML and CMOS Logic Families and its Comparison, standard TTL NAND Gate Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tristate outputs, CMOS transmission gate,

UNIT - V Integrated Circuits: Classification, chip size and circuit complexity, basic information of Opamp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC Characteristics, 741 opamp and its features, modes of operation-inverting, non-inverting, differential.

TEXT BOOKS:

1. Switching and Finite Automata Theory - ZviKohavi& Niraj K. Jha, 3rd Edition, Cambridge, 2010.
2. Modern Digital Electronics – R. P. Jain, 3rd Edition, 2007- Tata McGraw-Hill
3. Linear Integrated Circuits, D. Roy Chowdhury, New Age International(p) Ltd.
4. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, PHI

REFERENCE BOOKS:

1. Digital Design- Morris Mano, PHI, 4th Edition,2006
2. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI
3. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH.

22EC711OE: ELECTRONIC SENSORS (OE - II)

B.Tech. IV Year I Semester **L T P C**
3 0 0 3

Course Objectives:

1. To teach the characterization of sensors.
2. to provide knowledge on working of Electromechanical, Thermal, Magnetic and radiation sensors
3. To provide basic Understanding of Electro analytic and smart sensors
4. provide different applications of sensors.

Course Outcomes: Upon completing this course, the student will be able to

1. Learn about sensor Principle, Classification and Characterization.
2. Explore the working of Electromechanical, Thermal, Magnetic radiation and Electro analytic sensors.
3. Understand the basic concepts of Smart Sensors.
4. Design a system with sensors.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	-	-	-	-	1	-	-	1
CO2	1	1	2	2	-	-	-	-	1	-	-	1
CO3	1	1	1	1	-	-	-	-	1	-	-	1
CO4	2	2	3	2	-	-	-	-	1	-	-	1

UNIT – I: Sensors / Transducers: Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor – Types-Capacitive Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors

UNIT – II: Thermal Sensors: Introduction ,Gas thermometric Sensors ,Thermal Expansion Type Thermometric Sensors ,Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors ,Helium Low Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer, Resistance Change Type Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors

UNIT- III: Magnetic sensors: Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros.

UNIT – IV: Radiation Sensors: Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, Xray and Nuclear Radiation Sensors, Fibre Optic Sensors Electro analytical Sensors: The Electrochemical Cell, The Cell Potential - Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

UNIT - V Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation Sensors –Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing – Sensors for environmental Monitoring

TEXT BOOKS:

1. "Sensors and Transducers - D. Patranabis" –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravindraghu, CRC press, 2011

REFERENCE BOOKS:

1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media, 2014.
3. Sensors handbook- Sabriesoloman, 2nd Ed. TMH, 2009

22EC712OE: ELECTRONICS FOR HEALTH CARE (OE-II)

B.Tech. IV Year I Semester **L T P C**
3 0 0 3

Course Objective:

1. To provide knowledge on Health care data
2. To demonstrate need of Electronics in Health Care.
3. To give basic knowledge on electronic equipments used in medical field.

Course Outcomes: Upon completion of this course, the students will be able to

1. Know about health care data and its conversion to information and to knowledge.
2. Acquire knowledge on (Electronic Health Records) EHRs and their Implementation.
3. Understand the working of electronic devices used for the patient monitoring.
4. Know the concepts of Telemedicine and therapeutic devices used inside the human body

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	1	-	-	-	-	1	-	-	1
CO2	1	1	-	1	-	-	-	-	1	-	-	1
CO3	1	1	-	1	-	-	-	-	1	-	-	1
CO4	1	1	-	1	-	-	-	-	1	-	-	1

UNIT - I: Health care data, Information and Knowledge: Definitions and Concepts, Converting Data to Information to Knowledge, Clinical Data Warehouses, What makes Health Informatics Difficult, Why Health IT fails Sometimes, Terminology of Analytics, Challenges to Data Analytics, Research and application of analytics, Role of Informatics in analytics.

UNIT - II: Electronic Health Records: Introduction, Need for Electronic Health Records, Institute of Medicine's Vision for EHRs, Electronic Health Record Key Component, Electronic Prescribing, Electronic Health Record Adoption, Electronic Health Record Adoption and Meaningful use Challenges, Electronic Health Record Examples, Logical Steps to Selecting and Implementing an EHR

UNIT- III: Patient Monitoring Systems: System Concepts, Cardiac Monitor, Bedside Patient Monitoring Systems, Central Monitors, Measurement of Heart Rate, Measurement of Pulse Rate, Blood Pressure Measurement, Measurement of Temperature, Measurement of Respiration Rate, Catheterization Laboratory Instrumentation.

UNIT- IV: Biomedical Telemetry and Telemedicine: Wireless Telemetry, Single Channel Telemetry Systems, Multi-channel Wireless Telemetry Systems, Multi-patient Telemetry, Implantable Telemetry Systems, Transmission of Analog Physiological Signals, Over Telephone, Telemedicine.

UNIT- V: Therapeutic devices: Need for Cardiac Pacemaker, Implantable Pacemakers, DC Defibrillator, Electronics in the Anaesthetic Machine.

TEXT BOOKS:

1. Robret E. Hoyt MD FACP "Health Informatics" sixth edition 2007.
2. R. S. Kandpur "Biomedical Instrumentation Technology and Applications" second edition Tata McGraw-Hill.

REFERENCE BOOKS:

1. Edward H. Shortlliffe, James J.Cimino "Biomedical Informatics, Computer applications in Health care and Biomedicine" third edition Springer.
2. G.V.R.K. Acharyulu, Bhimaraya Metri, L. Kalyan Viswanath REDDY "Health care and Hospital Management Contemporary Issues and Strategies".

22EC713OE: TELECOMMUNICATIONS FOR SOCIETY (OE - II)

B.Tech. III Year II Semester **L T P C**
3 0 0 3

Course Objectives:

- To introduce Telecommunications and its vast development.
- To give knowledge on voice, Data and image transmission.
- To treat with different types of noise/distortions that occur during transmissions.
- To make topics like TV transmission by satellite and broadcasting understandable.

Course Outcomes: Upon completion of this course, the students will be able to

- Understand the concepts of simplex, half duplex, and full duplex of one-way and two-way circuits.
- Get knowledge on subscriber loop design and VF repeaters of voice telephony.
- Get brief overview of video transmission and its broadcasting standardsin television transmission.
- Know different of modes of television transmission.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	1	-	-	-	-	1	-	-	1
CO2	1	1	-	1	-	-	-	-	1	-	-	1
CO3	1	1	-	1	-	-	-	-	1	-	-	1
CO4	1	1	-	1	-	-	-	-	1	-	-	1

UNIT - I:

Introductory Topics in Telecommunications: End-Users, Nodes, and Connectivities, Telephone Numbering and Routing, Use Of Tandem Switches in aLocal Area Connectivity, Introduction to the Busy Hour and Grade Of Service, Simplex, Half-Duplex, and Full Duplex, One-Way and Two-Way Circuits, Network Topologies, Variations in Traffic Flow, Quality Of Service, Standardization in Telecommunications, The Organization of the PSTN in the United States, Points Of Presence.

UNIT - II:

Quality of Service and Telecommunication Impairments: Objective, Quality of Service: Voice, Data, and Image, Signal-to-Noise Ratio, Voice Transmission, Data Circuits, Video (Television), The Three Basic Impairments and How They Affect the End-User, Amplitude Distortion, Phase Distortion, Noise Level, Typical Levels, Echo and Singing.

UNIT - III:

Transmission Aspects of Voice Telephony: Definition of the Voice Channel, Operation of the Telephone Subset, Subscriber Loop Design, Design of Local Area Wire-Pair Trunks (Junctions), VF Repeaters (Amplifiers).

UNIT - IV:

Television Transmission: Background and Objectives, An Appreciation of Video Transmission, Critical Video Parameters, Video Transmission Standards (Criteria for Broadcasters), Methods of Program Channel Transmission, The Transmission of Video Over LOS Microwave, TV Transmission by Satellite Relay, Digital Television, Conference Television, Brief Overview of Frame Transport for Video Conferencing.

UNIT - V:

Community Antenna Television (Cable Television): Objective and Scope, The Evolution of CATV, System Impairments and Performance Measures, Hybrid Fiber-Coax (HFC) Systems, Digital Transmission of CATV Signals, Two-Way CATV Systems, Two-Way Voice and Data over CATV Systems Based on the DOCSIS 2.0 Specification, Subsplit/Extended Subsplit Frequency Plan, Other General Information.

TEXT BOOKS:

1. Roger L. Freeman "Fundamentals of Telecommunications" 2nd Edition, John Wiley & Sons Publications 2005.
2. Annabel Z. Dodd "The Essential Guide to Telecommunications" 5thEdition , Prentice Hall 2012.

REFERENCE BOOKS:

1. JYRKI T. J. PENTTINEN "THE TELECOMMUNICATIONS HANDBOOK" John Wiley & Sons Publications 2015.
2. Prof. Dr. Muhammad EL-SABA "Telecommunications systems and data networks" 3rd Edition 2015.

22EC811OE: MEASURING INSTRUMENTS (OE - III)

B.Tech. IV Year II Semester **L T P C**
3 0 0 3

Course Objectives:

1. To provide basic knowledge in transduction principles, sensors and transducer technology and measurement systems.
2. To provide better familiarity with the concepts of Sensors and Measurements.
3. To provide the knowledge of various measurement methods of physical parameters like velocity, acceleration, force, pressure and viscosity.

Course Outcomes: Upon Completion of this course the student is

1. Able to identify suitable sensors and transducers for real time applications.
2. Able to translate theoretical concepts into working models.
3. Able to understand the basics of measuring devices and use them in relevant situation.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	-	-	-	-	1	-	-	1
CO2	2	2	2	1	-	-	-	-	1	-	-	1
CO3	1	1	1	1	-	-	-	-	1	-	-	1

UNIT-I Introduction to measurements: Physical measurement, Forms and methods of measurements, Measurement errors, Statistical analysis of measurement data, Probability of errors, Limiting errors, Standards, Definition of standard units, International standards, Primary standards, Secondary standards, Working standards, Voltage standard, Resistance standard, Current standard, Capacitance standard, Time and frequency standards.

UNIT - II Passive Sensors Resistive Sensors: Potentiometers, Strain Gages, Resistive Temperature Detectors (RTDs), Thermistors, Light-dependent Resistors (LDRs), Resistive Hygrometers, Capacitive Sensors: Variable capacitor, Differential capacitor, Inductive Sensors: Reluctance variation sensors, Eddy current sensors.

UNIT - III Metrology: Measurement of length – Plainness – Area – Diameter – Roughness – Angle – Comparators – Gauge Blocks, Optical Methods for length and distance measurements. Velocity and Acceleration Measurement: Relative velocity – Translational and Rotational velocity measurements – Revolution counters and Timers - Magnetic and Photoelectric pulse counting stroboscopic methods, Accelerometers- different types, Gyroscopes-applications.

UNIT - IV Force and Pressure Measurement: Gyroscopic Force Measurement – Vibrating wire Force transducer. Basics of Pressure measurement –Manometer types – Force-Balance and Vibrating Cylinder Transducers – High- and Low-Pressure measurement

UNIT - V Flow: Density and Viscosity Measurements: Flow Meters- Head type, Area type (Rota meter), electromagnetic type, Positive displacement type, Density measurements – Strain Gauge load cell method – Buoyancy method. Units of Viscosity, Two float viscorator –Industrial consistency meter

TEXT BOOKS:

1. Measurement Systems – Applications and Design – by Doeblin E.O., 4/e, McGraw Hill International, 1990.
2. Principles of Industrial Instrumentation – Patranabis D. TMH. End edition 1997.

REFERENCE BOOKS:

1. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
2. Instrument Transducers – An Introduction to their Performance and design – by Herman K.P. Neubrat, Oxford University Press.
3. Measurement system: Applications and Design – by E.O. Doeblin, McGraw Hill Publications.
4. Electronic Instrumentation by H.S. Kalsi.

22EC812OE: COMMUNICATION TECHNOLOGIES (OE-III)

B.Tech. IV Year II Semester **L T P C**
3 0 0 3

Course Objectives:

1. To give an overview of Source-Destination communication.
2. To provide the different modes of communication technologies like wireless and cellular mobile networks.
3. To make familiar with the generations of communications like 1G, 2G, 3G, 4G and 5G.
4. To give brief explanation on security of network and its management.

Course Outcomes: Upon completing this course, the student will be able to

1. Understand the information theory and its coding styles.
2. Acquire knowledge on satellite communication and broadcasting services.
3. Know GSM, LTE and 5G mobile networks.
4. Know about network security through encryption and decryption.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	-	-	-	-	1	-	-	1
CO2	2	2	2	1	-	-	-	-	1	-	-	1
CO3	1	1	-	1	-	-	-	-	1	-	-	1
CO4	1	1	-	1	-	-	-	-	1	-	-	1

UNIT - I:

Information Theory: Shanon Capacity, Multimedia Data, Data Processing, Boolean Logics, Information Content, Entropy, Source Coding, Channel Coding, Modulation Schemes, Internet.

UNIT - II:

Wireless Communication Technologies: WLAN, Wifi, Bluetooth, Other Wireless PAN And WAN Technologies, Satellite Communications, Broadcast Services.

UNIT - III:

Cellular Mobile Networks: GSM(2G), UMTS (3G), LTE(4G), 5G Mobile Networks, Mobile Network Planning Aspects.

UNIT - IV:

Free Space Optical Communications: Optical Fiber, FTTC, FTTH, FTTBS, Free Space Optical Link, Channel Model with Different Factors, Deep Space Optical Communications.

UNIT - V:

Network Security and Management: Symmetrical Encryption, Asymmetrical Encryption, Authentication, Hash-Value, Integrity Check, Telecommunications Management Network, SNMP, Functionalities of Network Management, Trends and Future Development.

TEXT BOOKS:

1. Shun-Ping Chen, “Fundamentals of Information and Communication Technologies” 2020
2. B.P. Lathi, “Communication systems”- BS Publications, 2006.

REFERENCE BOOKS:

1. Simon Haykin, John Wiley “Digital Communications” 2005.
2. Herbert Taub, Donald L Schilling Gautham Saha “Principles of Communication systems” 3rd edition McGraw-Hill 2008.

22EC813OE: FUNDAMENTALS OF SOCIAL NETWORKS (OE-III)

B.Tech. IV Year II Semester **L T P C**
3 0 0 3

Course Objectives:

1. To give overview on social networks.
2. To make social media, information networks and world wide web concepts more familiar.
3. To provide knowledge on social network ties.
4. To provide knowledge on power laws related to information networks.

Course outcomes: upon completing this course the students will be able to

1. Understand concepts like small-world experiment and snowball sampling related to social networks.
2. Get knowledge on ties, weak ties and their strength.
3. Know about structure of the web, modern web search, link analysis using hubs.
4. Acquire knowledge on power laws and analysis of Rich-get-Richer phenomena.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	1	-	-	-	-	1	-	-	1
CO2	1	1	-	1	-	-	-	-	1	-	-	1
CO3	1	1	1	1	-	-	-	-	1	-	-	1
CO4	1	1	1	1	-	-	-	-	1	-	-	1

UNIT - I: Introduction to social networks: The Empirical Study of Social Networks, Interviews and Questionnaires, Direct Observation, Data from Archival or Third-Party Records, Affiliation Networks, The Small-World Experiment, Snowball Sampling, Contact Tracing, and Random Walks.

UNIT - II: Graph theory and Social Networks: Basic definitions, Paths and Connectivity, The strength of weak ties, Tie Strength and Network Structure in Large-Scale Data, Tie strength, social media, passive engagement.

UNIT - III: Information networks and World Wide Web: The World Wide Web, Information Networks, Hypertext, and Associative Memory, The Web as a Directed Graph, The Bow-Tie Structure of the Web, the emergence of web 2.0, Searching the Web: The Problem of Ranking Link Analysis using Hubs and Authorities, PageRank, Applying Link Analysis in Modern Web Search.

UNIT - IV: Power Laws and Rich-Get-Richer Phenomena: Popularity as a Network Phenomenon, Power Laws, Rich-Get-Richer Models, The Unpredictability of Rich-Get-Richer Effects, The Long Tail, The Effect of Search Tools and Recommendation Systems, Advanced Material: Analysis of Rich-Get- Richer Processes.

UNIT - V: The Small-World Phenomenon: Six Degrees of Separation, Structure and Randomness, Decentralized Search, Modeling the Process of Decentralized Search, Empirical Analysis and Generalized Models, Core-Periphery Structures and Difficulties in Decentralized Search, Advanced Material: Analysis of Decentralized Search.

TEXT BOOKS:

1. M. E. J. Newman “Networks an introduction” Oxford University Press 2010.
2. Networks, Crowds and Markets by David Easley and Jon Kleinberg, Cambridge University Press, 2010.

REFERENCE BOOKS:

1. Social and Economic Networks by Matthew O. Jackson, Princeton University Press, 2010.
2. Maksim Tsvetovat and Alexander Kouznetsov. “Social Network Analysis for Startups”. O’Reilly Media, 2011.